Book Reviews

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Laying Siege to the Individualistic Concept of Plant Communities

Callaway, Ragan M. 2007. **Positive interactions and interdependence in plant communities.** Springer, New York. xi + 415 p. $249.00, ISBN: 978-1-4020-6223-0 (acid-free paper).

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The concept of the community has been the subject of a long and contentious debate amongst plant ecologists. In its most stereotypical form, the Clementsian model of holistic community development went head-to-head with a Gleasonian version of individualism and happenstance. Although few modern ecologists strictly ally with either stereotype, the "individualistic concept" rules the day. Rather than let sleeping dogs lie, Callaway has written a book attacking this dominant paradigm of community organization. In doing so, Callaway lays the groundwork for significant advances in plant community ecology. To replace this "individualistic concept," Callaway describes "an integrated community," one in which positive interactions among individuals and species refute the idea of individualism. This issue is of sincere and enduring interest for Callaway, as evidenced in part by his dedication of this book to his Ph.D. advisor, Bruce Mahall. This sincerity of interest and desire to highlight an alternative way of viewing the world is refreshing.

Callaway writes clearly on the subject of positive interactions, with humor and authority. It is hard not to appreciate a book that includes a line like "As many of us know, proximity to a more attractive neighbour may increase the potential for reproductive interactions, but it may reduce the quality of those interactions (R.M. Callaway, personal experience)." Within the text there are a few areas of repetition, such as when the Allee effect is described in depth in multiple chapters. However, overall this book is well written, and the images (taken primarily from published studies) are clear and effective in highlighting the main points.

The book is organized into six chapters, with the first being a very brief (13 pages) overview of conceptual models of community structure, the history of the study of facilitation, and a general overview of how understanding facilitation could alter how we view communities. The next two chapters are approximately 160 pages of descriptions of studies that have documented either direct (Chapter 2, "Direct mechanisms for facilitation") or indirect (Chapter 3, "Indirect mechanisms for facilitation") positive interactions among plants. Callaway himself acknowledges the impact of such a lengthy review when he says at the end of Chapter 2, "Amassing over 100 pages of review for direct facilitative mechanisms is a bit mind numbing, but sometimes science by siege can make a point." As a reader, I agree with this assessment. Callaway seems to be beating against a brick wall of established views of community organization with competition as a critical structuring force. I can't help but imagine part of the inspiration to writing this book lies with amassing decades of comments by reviewers questioning the generality or importance of facilitation in natural communities. Looking back, I wonder exactly what I have said as a reviewer of Callaway's work over the years!

Callaway's presentation of this overwhelming amount of evidence does show facilitation is widespread among plants, with consequences for individuals, populations, and communities. After reading this book, anyone who thinks otherwise is not really reading. To support this siege, Callaway has amassed over 1000 references, with the references section representing approximately 18% of the length of the book! This emphasis on reviewing the existing literature has a variety of impacts, some intended, some unintended. On the positive side, this literature review is very effective at showing that positive interactions are neither rare nor necessarily of low effect size. However, after several chapters of detailed reviews of studies, I was expecting the book to move from review to synthesis, providing a clear vision to the future. Instead, Callaway maintains the tactic of review in the second half of the book, with discussion of competition-facilitation gradients (Chapter 4, "Interaction between competition and facilitation"), evidence for species-specific positive interactions (Chapter 5, "Species-specific positive interactions").

The final chapter, entitled "Positive interactions and community organization," is the shortest of the five major chapters (39 pages). In this last chapter Callaway describes a number of studies and pre-existing ideas about how facilitation can alter niche space, impact diversity-function relationships, and change community structure. These ideas are all quite important, and certainly worthy of follow-up study. However, the most significant impact of this chapter is to highlight studies that have been overlooked, rather than to provide a new theoretical framework or even a list of future research priorities.

The emphasis on review, rather than focusing on the development of a new theoretical construct, can be seen quite clearly through comparisons with three influential books that challenged dogma and/or synthesized fields of research. Paul A. Keddy's, *Competition* (Second edition. 2001. Springer, New York), John L. Harper's *Population biology of plants* (1981. Academic Press, England, United Kingdom), and Stephen Hubbell's *Unified neutral theory of biodiversity and biogeography* (2001. Princeton University Press, Princeton, New Jersey), all dedicate less than 10% of their lengths to references. Although Callaway has very effectively knocked down the walls of the individualistic theory of community organization, the book would have been more effective if more space had been given toward building up a new theory.

Overall, I find this book to be a valuable addition to my bookcase. The extensive references provide a wonderful entry point for anyone who wants to learn more about positive interactions. Perhaps even more telling about the potential impact of this book is the effects it has had on how I look at my own research, and how I teach plant ecology. I have traditionally done like many others, saving a lecture or designing an occasional experiment focused on positive interactions. What I have not done, is integrate this information into day-to-day operations, and Callaway has convinced me that viewing facilitation as something outside the "normal" set of ecological interactions is just not consistent with current ecological understanding and empirical data. At this point, I am happy to see the individualistic paradigm knocked down; however, the real work will come when the siege has ended, and rebuilding begins.

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